

THE INTERRELATIONSHIP BETWEEN FOREIGN DIRECT INVESTMENT AND GROSS DOMESTIC PRODUCT IN SOUTH AFRICA

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ABSTRACT

Foreign Direct Investment continues to play an essential role in developing economies and around the world. The linkage between foreign direct investment and economic growth is crucial for policy implication for the host country. Numerous studies have been conducted between foreign direct investment and economic growth, yet no agreement has developed. Therefore, it is viable to examine the nexus between foreign direct investment and economic growth in South Africa. The modified Toda-Yamamoto Granger causality test was used in this study covering time series data from 1970 to 2016. Unit root tests were employed to define the order of integration. The long-run relationship between the variables was determined using the Johansen co-integration test. To determine the direction of the variables Granger causality test was employed. The results indicated that both variables are integrated on order one I (1) after the first difference. The study confirmed a long-run relationship among the variables. The Granger causality test supports the neutral hypothesis, meaning that FDI does not Granger cause GDP and vice versa. Policymakers should focus on eradicating challenges that can affect inflows of FDI. This study contributes to the existing body of literature.

KEYWORDS: *Toda and Yamamoto, Foreign Direct Investment, Economic Growth & South Africa*

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INTRODUCTION

The role of foreign direct investment (FDI) in developing economies and its position in the global economy cannot be underestimated. The FDI inflow has grown faster over the years. Researchers are pursuing their work to explain, understand and report findings of their respective studies on the impact of FDI. There are many definitions of FDI, but in this study, we use these two by the IMF and Matjekana. The International Monetary Fund (IMF), (2008) defines FDI as an investment involving long-term association and reflecting a lasting interest and control by the resident firm of the economy in the host country. According to Matjekana (2002) classified the path of flows into two categories, namely inward and outward flows. He defined investment in which foreign capital is invested in local resources as an inward FDI and investment of local capital invested in foreign countries as outward FDI.

By creating job opportunities for citizens in the host country, promoting growth, productivity, transfer of technology and export FDI promote economic growth to that host nation (World Bank, 2002). In order to alleviate socioeconomic problems, such as poverty, inequality and unemployment, South Africa as a developing nation needs the assistance of FDI. According to United Nations Conference on Trade and Development (UNCTAD)

(2016), the ability of the host country to use FDI well determines the impact of FDI on economic growth (GDP). South Africa was ranked among the top countries for foreign direct investments (A. T. Kearney Foreign Direct Investment (FDI) Confidence Index, 2017). According to A. T. Kearney report, (2017) by improving short and long-term economic prospects and investment potential in the manufacturing sector of the country, South Africa made a comeback in the index. The UNCTAD (2016) confirmed that over the last decade FDI in South Africa dropped by 69% to \$ 1.8 billion.

South Africa has been selected for investigation mainly because is one of the most sophisticated and promising emerging markets globally and is the gateway of Africa and one of the largest economies as measured by GDP and also the country receives high FDI inflows (World Bank, 2016). Some of the key points to why investing in South Africa is important, the county has a reasonably competitive domestic economy, high market potential and well-developed infrastructure. The country's democracy is well established with transparent and contested elections and an appreciation for the rule of law. The challenges which may discourage investors such as the FDI are, violence, crime and corruption continued to widespread, higher electricity costs, labor strikes and the direction of policymaking particularly economic policies and structural reform issues.

Covering the period from 1970 to 2016, this study aims to examine the causal relationship between FDI and GDP is South Africa using the augmented Granger causality test proposed by Toda and Yamamoto. This study will also examine the direction of causality between the two variables and contribute to the present literature and inform policymakers. These studies also seek to find out that does an inflow of FDI can lead to GDP growth or vice versa. Econometric tools will be employed to achieve the objective(s) of this study.

The rest of this study is structured as follows: Section two covers the literature review of the causal relation between FDI and GDP. Section three presents the research methodology used in the study and section four presents the empirical findings. The last section presents conclusions and policy recommendations for the study.

LITERATURE REVIEW

Evidence in the existing empirical literature on the causal relationship between FDI and (GDP) is inconclusive. There is an ongoing debate about the economic impact of multinationals on host countries, especially in developing nations. In most developing countries changes in composition and direction of FDI have important views on government policies. This study used a bivariate causality framework. The outcome of FDI on the growth of the host country has been debated widely in the literature. The existing theoretical studies resulted in efforts by nations to attract more FDI from the common belief that FDI has a positive effect; transfer of technology, employee training, labor mobility, technical assistance and access of local firms to the international market for export. Empirical studies of ((Draper, Kiratu, & Samuel, 2010); (Mangir, Acet, & Baoua, 2017); (Nair-Reichert & Weinhold, 2000); and (Hoekman & Newfarmer, 2005) support the argument that FDI experts a positive impact in the host countries. The role of FDI is critical to the economic growth of developing countries because it is a vital source of private capital formation in these economies. FDI promotes economic growth as it helps to overcome the capital shortage in the host country. (Kummer-noormamode, 2015) denoted the positive contribution of FDI in the economic growth. Likewise, (Yan, 2011) emphasize the positive role of FDI in the growth of developing economies.

Some of the Factors that Can Determine the Foreign Investment to Flow in are as Follows

- Return on investment in the host country has been widely considered as one of the main determinants of FDI inflows in many studies, FDI will go to countries that pay a higher return on capital. Carim (1994) noted two fundamental conditions for foreign investment, which are the investor's confidence and profitability. According to Onyeiwu (2003), the profitability of investment is the primary interest of foreign investors. He said that the decision to invest in a host country depends on the return and risk of investment in the economy.
- Good infrastructure development increases the productivity of investment and therefore stimulates inflows of FDI.
- Cost of labor- foreign investors are alleged to take advantage of low labor cost by investing in developing economies where the cost is low.
- To measure openness of an economy, the ratio of trade to GDP is often used.
- Political risk is the empirical relationship between political instability and FDI flows.
- Availability of natural resources is another determinant of FDI inflows as noted by Asiedu (2006). In addition, Xolani (2011) found that South Africa is rich with natural resources and relatively low cost of doing business and good infrastructure to the rest of the African countries, which will result in a high return on investment.

Table 1: Selected Studies on FDI and GDP

Author (s)	Periods	Method	Findings
(Kim, 2017)	1986-2015	ARDL and correction model	In the long run, FDI has a significant positive impact on GDP in Vietnam
(Sothan, 2017)	1980-2014	Granger causality test based on vector error correction model	Provide strong evidence that FDI has an impact on Cambodia GDP.
(Insah, 2013)	1980-2010	Dynamic Ordinary Least Squares (DOLS)	There is a positive relationship between GDP and FDI in Ghana.
(Shawa & Shen, 2013)	1980-2012	Johansen co-integration and Granger causality test	No causality was discovered between FDI and GDP growth in Tanzania
(Tshepo, 2014)	1990-2013	Johansen co-integration and Granger causality test	A positive unidirectional relationship running from FDI to GDP in South Africa.
(Sabir, Hamza, Arshad, Sajid, & Tahir, 2015)	1970-2012	Unit root test, Johansen co-integration test, and Granger causality test	No causal relationship was found between FDI and GDP in Pakistan
(Dogan, 2014)	1970-2011	Johansen co-integration and Granger causality test	One way effect causality running from FDI to GDPGR
(Pradhan, 2010)	1970-2008	Evidence from Causality Approach	Presence of interdependence between India and ASIAN-5countries
(Dar, Muhammad, & Mehmood, 2016)	1980-2013	VECM and Johansen Co-integration model	Confirm long-run relationship between the variables

(Frimpong & Oteng-abayie, 2006)	1970-2002	Toda-Yamamoto causality test	Unidirectional from FDI to GDP growth
(Munyanyi, 2017)	1975-2007	Autoregressive Distributed Lag (ARDL) co-integration approach	Short and long-run relationship results show a positive relationship between FDI and GDP.
(Mohammed, Mosté, & Mohammed, 2015)	1980-2010	Dynamic Panel Co-Integration test	Unidirectional causality from FDI to GDP

The relation among FDI and GDP is very divisive; it differs from country to country, and even within countries it varies from the time period, such as panel data, cross-sectional data and time series data. For example, (Oladipo, 2012) discovered the FDI-GDP nexus with a panel data of sixteen (16) developing countries in Latin America and the Caribbean economies. Furthermore, Li and Liu (2005) studied the endogenous connection between FDI and GDP for eighty-four (84) countries over the period 1970-1999.

In the nutshell, the role of FDI in the economic growth of a host country remains an arguable matter due to different conditions being faced by various developing nations. Reason being is that researcher's use different theoretical model and employ different econometric techniques. As noted in the above literature not many studies have been conducted regarding South Africa. This study would be a valued addition to the existing body literature or knowledge about the role of FDI in South Africa's economic growth.

RESEARCH METHODOLOGY

Description of the Data

In this study annual time series data from 1970 to 2016 was used to examine the causal relationship between FDI inflows (annual % of GDP) and GDP growth (annual %) as a measure of economic growth in South Africa. The data used in this study were obtained from the World Development Indicators 2018 database of the World Bank. E-views 10 were used to analyze the data for this study.

Research Model

In this study, the Toda-Yamamoto procedure of Granger causality has been used (Toda & Yamamoto, 1995). The nature of this test, it requires the estimation of an augmented vector autoregressive (VAR) irrespective of whether the time series is nonintegrated or integrated. In case of Toda-Yamamoto procedure, a Modified Wald (MWALD) test for restrictions on the parameters of the VAR model has been employed where p is the optimal lag length of the VAR model. This test has an asymptotic chi-squared distribution with p degrees of freedom in the limit when a VAR $p+d_{max}$ are estimated (where d_{max} is the maximal order of integration for the series in the system).

Three stages are involved in implementing the procedure. The first stage is to test each of the time series to determine the maximum order of integration d_{max} of the variables in the system using tests. This study employed three tests, the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1986), the Phillips-Perron (PP) test (Phillips & Perron, 1988), and Kwiatkowski, Phillips, Schmidt and, Shin (KPSS) test (Kwiatkowski, Phillips, Schmidt & Shin, 1992). The second stage includes the determination of the lag length (p), which is obtained in the process of the VAR in levels among the variables in the system by using different lag length criteria such as the LR test statistic, Akaike information criterion (AIC), Schwarz information criterion (SIC), Final prediction error (FPE) and Hannan-Quinn (HQ) information criterion. In order to scrutinize the authenticity of the optimal lag length chosen by using LR test statistic, AIC, SIC, FPE

and HQ, the Langrage Multiplier (LM) test on residuals for serial independence has been applied. The third stage is the modified Wald test procedure has been employed to test the VAR (k) model for causality. The optimal lag length is equal to $k = (p + d_{max})$.

In this study the Toda and Yamamoto augmented Granger causality test has been obtained by estimating VAR model as follows:

$$FDI_t = \alpha_1 + \sum_{i=1}^{p+d_{max}} \beta_{1i} FDI_{t-i} + \sum_{i=1}^{p+d_{max}} \delta_{1i} GDP_{t-i} + \mu_{1t}. \quad (1)$$

$$GDP_t = \alpha_2 + \sum_{i=1}^{p+d_{max}} \beta_{2i} FDI_{t-i} + \sum_{i=1}^{p+d_{max}} \delta_{2i} GDP_{t-i} + \mu_{2t}. \quad (2)$$

Where, FDI_t is the FDI net inflow as (annual % of GDP) at time t and GDP_t is the GDP growth (annual %) at time t.

In equations (1) and (2), there is causality from FDI to GDP growth rate if null hypothesis $H_0: \beta_{1i} = \beta_{2i} = \dots = \beta_{2i} \neq 0$ Likewise, there is causality from gross domestic product (GDP) growth rate to FDI if the null hypothesis $H_0: \delta_{1i} = \delta_{2i} = \dots = \delta_{2i} \neq 0$.

According to Gujarati (1995) noted there are a few shortcomings in using a Granger causality test like the model specification problem and number of lags and the spurious regression of non-stationary problem (Huang, Kao et al., 2004). Toda and Yamamoto (1995) is concern superior to the traditional Granger causality, because of this approach does cure of above-shortcoming of Granger causality. For testing Toda-Yamamoto, we have no need to bind us that all variables must be stationary at the level or first difference. Toda and Yamamoto, a Granger causality test which is valid irrespective of whether a series is $I(0)$, $I(1)$, or $I(2)$, nonintegrated or co-integrated of any uninformed order (Wolde-Rafael, 2005). The advantages of Toda and Yamamoto (1995), is that this approach makes granger causality much easier because of, in this method, scholars have no need to test co-integration or convert VAR into ECM. First we check for unit root to know the order of integration between time series, second, we run the VAR model in level form and lastly we check the lag length.

EMPIRICAL ANALYSIS

The results were calculated using Eviews 10 and are presented in the following section.

Unit Root Test

The ADF, PP, and KPSS were used to study the stationarity properties with the inclusion intercept and trend and intercept at the level and first difference. Table 1 shows the results of the ADF unit root test, indicating that GDP is stationary at the level, being integrated of order zero $I(0)$. On the other hand, FDI is non-stationary at level, but stationary at first differences, being integrated of order one $I(1)$. Therefore, the maximum order of integration of the variables in the system under ADF unit root test is one, $d_{max}=1$.

In the empirical analysis, before doing the co-integration test, the degree of integration and stationary properties of the variables need to be examined. In the first step, different types of unit root tests are performed. The Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979), Phillips-Perron (PP) test (Phillips & Perron, 1988), and Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test (Kwiatkowski, Phillips, Schmidt & Shin, 1992) were employed.

The literature on modern time series analysis offers dozens of methods for unit root testing. Since each of them has some weakness, in empirical studies, it is better not to rely on any particular test but to use several of them. To this end, we start with three unit root or stationarity test advocated by Dickey and Fuller (1979, 1981), Phillips and Perron (1998) and Kwiatkowski et al. (1992).

From the results in Table 2, it is shown that GDP is stationary at the level, being integrated of order $I(0)$, while on the other hand, FDI is non-stationary at level. Both variables are stationary at the first difference between intercept and trend with intercept. Under ADF unit root test the maximum order of integration is one or $I(1)$.

Table 2: ADF Unit Root Test

Variables	ADF			
	Intercept		Trend and Intercept	
	Level	1 st Difference	Level	1 st Difference
GDP	-4.7103***	-7.1236***	-4.6584***	-7.0318***
FDI	-1.4056	-8.5396***	-5.7263***	-8.4225***

*** indicates significant at 1% level

Source: Author used E-views 10

Table 3 shows the PP unit root test, indicating that both variables are stationary at the level, being integrated of order $I(0)$. Similarly, both FDI and GDP are stationary at the first difference, being integrated of order $I(1)$. Then, the maximum order of integration of the variables under PP unit root test is one.

Table 3: PP Unit Root Test

Variables	PP			
	Intercept		Trend and Intercept	
	Level	1 st Difference	Level	1 st Difference
GDP	-4.5307***	-21.6087***	-4.5147***	-21.1734***
FDI	-4.8318***	-17.1072***	-5.7121***	-17.0638***

*** indicates significant at 1% level

Source: Author used E-views 10

The KPSS unit root test depicts in Table 4 show that FDI is non-stationary at the level, but stationary at first difference, being integrated of order $I(1)$. On the other hand, GDP is stationary at the level, being integrated of order $I(0)$. Hence, the maximum order of integration of the variables in the system under KPSS unit root is one.

Table 4: KPSS Unit Root Test

Variables	KPSS			
	Intercept		Trend and Intercept	
	Level	1 st Difference	Level	1 st Difference
GDP	0.1636***	0.5000***	0.1678***	0.5000***
FDI	0.5147	0.1628***	0.1875***	0.1479***

*** indicates significant at 1% level

Source: Author used E-views 10

In summary, ADF, PP and KPSS unit root tests confirm that the maximum order of integration of the variables is one.

Co-Integration Test

The study seeks to test the existence of co-integration among the variables under consideration. In this study, to examine the long-run relationship between the variables the Johansen co-integration test was used. Table 5 illustrates the

empirical results of the co-integration analysis by comparing the trace and maximum statistics with critical values at the 5% level of significance and the findings suggest evidence in favor of a long-run equilibrium relationship among the observed variables. These findings suggest that FDI may have an impact on economic growth in the long-run.

When the series becomes stationary at the first difference level, there is the possibility of linear combinations between the variables. The test applies to examine the same is known as co-integration (Granger, 1988). Co-integration technique examines whether there exists a long run relationship among the set of integrated variables. Literature of econometric of both univariate and multivariate has abundant techniques ((Engle, Granger, & Mar 2007) and (Johansen & Juselius, 1990) that can examine the long run relationship among different time series variables. This study, however, uses Johansen's technique to study the long run equilibrium.

Table 5: Johansen Co-Integration Test

H_0	Trace Statistics	Critical Value (5%)	Max-Eigen Statistics	Critical Value (5%)
None *	29.64507	15.49471	19.8133	14.2646
At most 1*	9.831735	3.841466	9.83174	3.84147

Source: Author used E-views 10

Toda-Yamamoto Granger Causality Test

In examining the causal relationship between FDI inflows and GDP growth, we adopt the modified WALD (MWALD) test proposed by Toda and Yamamota (1995). It is evident that from the empirical results in Table 6 that FDI does not Granger cause GDP with a chi-square of 0.443053 and a probability of 0.8013. In the table where GDP is taken as a dependent variable, we lack sufficient evidence to reject the null hypothesis. The null hypothesis is that FDI does not Granger cause GDP at the 5% level of significance and the alternative hypothesis that FDI does Granger cause GDP. On the other hand, where FDI is taken as a dependent variable, the null hypothesis is that GDP does not cause Granger cause FDI. The probability value 0.1590 suggests that we fail to reject the null hypothesis in favor of the alternative hypothesis. The results both support the neutrality hypothesis, meaning that there is no causal relation between FDI and GDP. These results are in line with of (Sabir et al., 2015) and (Shawa & Shen, 2013) and differ from ((Insah, 2013); (Dogan, 2014) and (Sothan, 2017)

Table 6: VAR Granger Causality Test

Dependent variable GDP				
Excluded	Chi-sq	df	Prob.	Decision
FDI	0.443053	2	0.8013	Accept
Dependent Variable FDI				
Excluded	Chi-sq	df	Prob.	Decision
GDP	3.677889	2	0.1590	Accept

Source: Author used E-views 10

CONCLUSIONS

This study examined the causal relationship between FDI inflows (% annual GDP) and GDP growth (annual %) in South Africa covering the period from 1970 to 2016 within a vector autoregressive (VAR) model. Unit root test conducted on the variables shows that all the variables are stationary at the first difference, being integrated of order one $I(1)$. Using the Johansen co-integration test, the study found a long run relationship among the variables. The direction of the variables was tested using the modified version of the Granger causality test proposed by Toda and Yamamoto (1995).

The empirical findings indicate that there is no direction among the variables, which support the neutral hypothesis, similar results were found by (Ali & Mingque, 2018) for Asian developing countries and (Shawa & Shen, 2013) for Tanzania and also (Sabir et al., 2015) for Pakistan. These results differ from (Ahmed, 2015), who found a unidirectional causality running from FDI to GDP growth rate in Bangladesh. (Kim, 2017) found FDI has a significant positive impact on GDP in Vietnam. See also (Tshepo, 2014) found a positive unidirectional relation running from FDI to GDP. Various diagnostic tests, such as autocorrelation, normality, and heteroscedasticity were employed to test the reliability of the results. This study should serve as a guide to policymakers, academics, and economists. Policy makers should focus on eliminating challenges such as political risk, labor brokers, and strikes in South Africa. The government should produce clear macroeconomic policies that will attract FDI inflows in the country.

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